CLAIMS

1. A hot-rolled austenitic iron/carbon/manganese steel sheet, the strength of which is greater than 900 MPa, the product (strength (in MPa) × elongation at fracture (in %)) of which is greater than 45 000 and the chemical composition of which comprises, the contents being expressed by weight:

$0.5\% \leq C \leq 0.7\%$

$17\% \leq Mn \leq 24\%$

$Si \leq 3\%$

$Al \leq 0.050\%$

$S \leq 0.030\%$

$P \leq 0.080\%$

$N \leq 0.1\%$,

and, optionally, one or more elements such that:

$Cr \leq 1\%$

$Mo \leq 0.40\%$

$Ni \leq 1\%$

$Cu \leq 5\%$

$Ti \leq 0.50\%$

$Nb \leq 0.50\%$

$V \leq 0.50\%$,

the rest of the composition consisting of iron and inevitable impurities resulting from the smelting, the recrystallized fraction of the steel being greater than 75%, the surface fraction of precipitated carbides of the steel being less than 1.5% and the mean grain size of the steel being less than 18 microns.

2. A hot-rolled austenitic iron/carbon/manganese steel sheet, the strength of which is greater than 900 MPa, the product (strength (in MPa) × elongation at fracture (in %)) of which is greater than 60 000 and the chemical composition of which comprises, the contents being expressed by weight:

$0.5\% \leq C \leq 0.7\%$

$17\% \leq Mn \leq 24\%$

$Si \leq 3\%$

$Al \leq 0.050\%$

$S \leq 0.030\%$

$P \leq 0.080\%$

$N \leq 0.1\%$,

and, optionally, one or more elements such that:

$Cr \leq 1\%$

$Mo \leq 0.40\%$

$Ni \leq 1\%$

$Cu \leq 5\%$

$Ti \leq 0.50\%$

$Nb \leq 0.50\%$

$V \leq 0.50\%$,

the rest of the composition consisting of iron and inevitable impurities resulting from the smelting, the recrystallized fraction of the steel being equal to 100%, the surface fraction of precipitated carbides of the steel being equal to 0% and the mean grain size of the steel being less than 10 microns.

3. A process for manufacturing a hot-rolled sheet made of iron/carbon/manganese steel, in which:

- a steel is smelted whose chemical composition comprises, the contents being expressed by weight:

$0.5\% \leq C \leq 0.7\%$

$17\% \leq Mn \leq 24\%$

$Si \leq 3\%$

$Al \leq 0.050\%$

$S \leq 0.030\%$

$P \leq 0.080\%$

$N \leq 0.1\%$,

and, optionally, one or more elements such that:

$Cr \leq 1\%$

$Mo \leq 0.40\%$

$Ni \leq 1\%$

$Cu \leq 5\%$

$Ti \leq 0.50\%$

$Nb \leq 0.50\%$

$V \leq 0.50\%$,

the rest of the composition consisting of iron and inevitable impurities resulting from the smelting;

- a semifinished product is cast from this steel;
- said semifinished product of said steel composition is heated to a temperature of between 1100 and 1300°C;
- said semifinished product is rolled with an end-of-rolling temperature of 890°C or higher;
- a delay is observed between said end of rolling and a subsequent rapid cooling operation, in such a way that the point defined by said delay and said end-of-rolling temperature lies within an area defined by the ABCD'E'F'A plot, and preferably the ABCDEFA plot, of figure 1; and
- said sheet is coiled at a temperature below 580°C.

4. The process as claimed in claim 3, wherein said semifinished product is cast in the form of thin strip, by being cast between steel rolls.

5. The manufacturing process as claimed in claim 3 or 4, wherein, after said coiling, said hot-rolled sheet is subjected to a cold deformation operation with an equivalent deformation ratio of 30% or less.

6. A cold-rolled austenitic iron/carbon/manganese steel sheet, the strength of which is greater than 950 MPa, the product (strength (in MPa) × elongation at fracture (in %)) of which is greater than 45000 and the chemical composition of which comprises, the contents being expressed by weight:

$0.5\% \leq C \leq 0.7\%$

$17\% \leq Mn \leq 24\%$

$Si \leq 3\%$

$Al \leq 0.050\%$

$S \leq 0.030\%$

$P \leq 0.080\%$

$N \leq 0.1\%$,

and, optionally, one or more elements such that:

$Cr \leq 1\%$

$Mo \leq 0.40\%$

$Ni \leq 1\%$

$Cu \leq 5\%$

$Ti \leq 0.50\%$

$Nb \leq 0.50\%$

$V \leq 0.50\%$,

the rest of the composition consisting of iron and inevitable impurities resulting from the smelting, the recrystallized fraction of the structure of the steel being greater than 75%, the surface fraction of precipitated carbides of the steel being less than 1.5% and the mean grain size of the steel being less than 6 microns.

7. A process for manufacturing a cold-rolled austenitic iron/carbon/manganese steel sheet, wherein:

- a hot-rolled sheet obtained by the process as claimed in claim 3 or 4 is supplied;
- at least one cold-rolling step followed by an annealing operation is carried out, each step consisting in:
  - cold-rolling said sheet and
  - carrying out an annealing operation at a temperature of between 600 and 900°C for a time of between 10 and 500 seconds, followed by a cooling operation, the cooling rate being greater than 0.5°C/s,
- the austenitic grain size, before the final cold-rolling step followed by an annealing operation, being less than 18 microns.

8. The process for manufacturing a cold-rolled sheet as claimed in claim 7, wherein, after the final annealing, a cold-deformation operation is carried out with an equivalent deformation ratio of 30% or less.

9. The use of a sheet as claimed in any one of claims 1, 2 and 6 for the manufacture of reinforcing elements that are statically or dynamically stressed.

10. The use of a sheet manufactured by means of a process as claimed in any one of claims 3, 4, 5, 7 and 8 for the manufacture of reinforcing elements that are statically or dynamically stressed.